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PROPOSAL OF A COMPREHENSIVE CLINICAL TYPOLOGY OF ALCOHOL WITHDRAWAL—A CLUSTER ANALYSIS APPROACH

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Abstract — **Aims:** To characterize the various courses of alcohol withdrawal. **Methods:** The Alcohol Withdrawal Scale (AWS) was applied to 217 alcohol-dependent patients every 4 h till the symptoms of withdrawal had passed (until each of four consecutive scores were <3). Patients were medicated by a standardized treatment scheme according to AWS-scores. Hierarchical cluster analysis and discriminant analysis were applied. **Results:** We found five clusters representing increasing severity of alcohol withdrawal. Each cluster is characterized by a combination of the two maximum subscores (vegetative and psychopathological subscore) and three additional psychopathological symptoms (anxiety, disorientation, and hallucination). In 18.4% of the patients, relevant symptoms were not observed (cluster 1), 18.9% developed mild or moderate vegetative symptoms only (cluster 2), and 40.6% additional anxiety (cluster 3). In cluster 4 (11.1%) the most frequent psychopathological symptoms were disorientation and anxiety but no hallucinations, which could be observed only in cluster 5 (11.1%). Discriminant analysis using the maximum subscores at the first day of treatment as independent variables correctly predicted 89.9% of the five clusters. **Conclusions:** Our findings support a model of alcohol withdrawal clustering along the two dimensions of vegetative and psychopathological severity. Furthermore, the AWS may be useful to predict the course of alcohol withdrawal already at the first day of treatment.

INTRODUCTION

In a substantial number of empirical studies, efforts were made to characterize the symptoms and pathophysiological backgrounds of alcohol withdrawal as well as treatment consequences (Johnson, 1961; Gross *et al*., 1971; Ballenger and Post, 1978; Naranjo and Sellers, 1986; Adinoff *et al*., 1988; Sellers *et al*., 1991; Saitz *et al*., 1994; Wetterling, 1994). However, clinicians use a rather simple method to differentiate less severe vegetative withdrawal syndromes from severe delirium states on the one hand and from courses without relevant clinical symptoms on the other hand (Kanzow, 1986; Schuckit *et al*., 1993; Victor, 1990). Psychopathological symptoms such as anxiety and depression are also well known in alcohol withdrawal patients but—up to now—were not integrated into a comprehensive clinical concept of alcohol withdrawal (Mayo-Smith and Bernard, 1995).

The aim of the present study is to characterize different courses of alcohol withdrawal by observable symptoms and to propose a comprehensive clinical typology of alcohol withdrawal syndromes that would ideally fulfil the following clinical and methodological criteria: (i) All types should be in agreement with general clinical experience. (ii) These types should be clearly defined. (iii) Vegetative and psychopathological symptoms should be considered as well. (iv) The different types should be related to severity and duration of alcohol withdrawal. (v) Patients without relevant symptoms should be clearly identified. (vi) One type should represent the full delirium syndrome. (vii) All types should be predicted by data available at the start of assessment. (viii) The types should be associated with therapeutic consequences.

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In order to characterize the different aspects of alcohol withdrawal, including its dynamic course, operational criteria are needed for the valid and reliable assessment of symptoms and severity. Thus, several scales were developed for monitoring the clinical course and the treatment (Shaw *et al*., 1981; Kristensen *et al*., 1986; Banger *et al*., 1992; Metcalfe *et al*., 1995). The CIWA-A-Scale is a widespread scale, revised and shortened versions were published by Sullivan *et al*. (1989). Our work group developed the Alcohol Withdrawal Scale (AWS), which was previously reported by Wetterling *et al*. (1997). Therefore, the AWS is based on a factor-analysed version of the CIWA-A-Scale and consists of six vegetative (pulse rate, diastolic blood pressure, body temperature, breathing rate, sweating, and tremor) and five mental or psychopathological symptom items (agitation, anxiety, tactile disturbances, disorientation, and hallucinations) each of which are exactly operationalized. These two subscales lead to a maximum score of 17 points each. All items and the scoring system are clearly operationalized. The interrater reliability (based on scoring by the same team as in the present study) was good to excellent for single items, subscales, and the total scale with κ-values ranging from 0.64 to 1.0 (Wetterling *et al*., 1997). In addition, the AWS covers the whole spectrum of withdrawal syndromes including delirium.

METHOD

Procedure

Alcohol-dependent patients aged 18–65 years and without multiple substance abuse ($n = 6$) or severe medical conditions ($n = 5$) who were consecutively admitted for detoxification at the Department of Psychiatry, Luebeck Medical School, were prospectively studied ($n = 217$). Alcohol dependence was confirmed according to DSM-IV by the ward physician using the IDCL-checklist (Hiller *et al*., 1997). After medical

examination and drawing a blood sample, patients were asked to take part in the study and written informed consent was obtained after the procedure had been fully explained. The assessment started within 2 h of admission by applying the AWS for the first time (day 1 of withdrawal). This procedure was continued every 4 h during the entire period of the withdrawal, i.e. until each of four consecutive examinations resulted in an AWS total score ⩽3. Demographic data and the alcohol-related history were not obtained before withdrawal finished.

Of the 217 patients, 27.2% were female (age 43.4 ± 8.1 years), 72.8% were male (age 41.3 ± 9.4 years), and 84 still had detectable alcohol in the blood at the time of admission

Medication

A study of the natural course of alcohol withdrawal was not accepted for ethical reasons. So patients were medicated as follows: carbamazepine (600 mg/day) as a standard medication was given, when the AWS vegetative subscore (VS) was between 7 and 10 and the psychopathological subscore (PS) was <6. In case of reported previous withdrawal seizures carbamazepine was prescribed independent of AWS scores. On the appearance of a VS ⩾10 and/or a PS ⩾6, 384 mg clomethiazole was given every 2 to 4 h depending on severity of withdrawal symptoms. Patients additionally received haloperidol when the PS was ⩾10.

Statistics

All AWS score sheets were transferred into a data matrix and descriptive analyses were performed. For each subject the maximum VS, the maximum PS, and the maximum AWS-score were identified. The statistical analyses included mean, crosstabs, χ^2-test (two-tailed), analysis of variance (ANOVA), and a hierarchical cluster analysis procedure using SPSS, Windows version 10.0.7. The cluster analysis was performed by using standarized clustering variables (*Z*-scores). The Squared Euclidian Distance and the Ward's method for linking were applied. In order to predict these clusters the maximum VSs and PSs as well as specified items of the AWS—obtained within the first 24 h after admission—were analysed by a *post hoc* stepwise discriminant analysis. In a second step, demographic data and characteristics of the alcohol-related history were added to the analysis.

RESULTS

Withdrawal symptoms

The rates of withdrawal symptoms substantially varied between subjects (the rates of all subjects with this symptom and rates of the most severe degree of this symptom are reported): most frequent were tremor (at least when arms are raised and fingers are spread in 92.6%, spontaneously in 11.5%), sweating (at least wet hands in 87.1%, profuse sweating in 8.8%), tachycardia (pulse rate >100/min in 79.7%, >120/min in 34.6%), agitation (fumbling in 79.3%, 6.5% excited), and high diastolic blood pressure (>95 mmHg in 77.9%, >105 mmHg in 42.4%). Anxiety (at least when asked in 56.7%, spontaneously reported in 13.4%) and an increased body temperature (>37°C in 54.8%, >38°C in 5.5%) were less frequent. Disorientation (at least one modus and/or suggestibility in 20.3%, total confusion in 3.2%), tactile disturbances (easy distractibility in 18.4%, dialogue impossible in 4.1%), tachypnoea (breathing rate ⩾20/min in 12.4%, >24/min in 2.8%), as well as hallucinations (11.1%, severe degree in 2.3%) were substantially less frequent. Hallucinations and disorientation were found only for short periods in the majority of the affected subjects (58.7%), i.e. in one or two times of assessment.

Duration of withdrawal

The average duration of withdrawal of all subjects was 3.0 ± 2.0 days. In 24.0% of all patients withdrawal symptoms did not appear (AWS-Score ⩽3) at all, or finished within 24 h after admission. In 33.2% withdrawal symptoms finished during the second day, in 13.8% during the third day, in 10.6% during the fourth day, and in 7.8% during the fifth day. In only 10.8% the withdrawal period lasted >5 days (up to 10 days).

Cluster analysis

Cluster analysis yielded five clusters representing an increasing severity of alcohol withdrawal. Each cluster is characterized by a combination of the maximum VS, of the maximum PS, and of the presence or absence of anxiety, disorientation, and hallucination.

Of all 217 patients, 18.4% did not develop any clinically relevant symptoms (cluster 1). All of these subjects reached a maximum AWS-score ⩽5, a maximum VS ⩽4, and a maximum PS ⩽2 at each of the first five assessments (first day). Apart from one convulsive event, none of these patients developed any psychiatric or medical complication during the entire period of observation until discharge, and Anxiety, disorientation, or hallucination were not present. Cluster 2 was nearly as frequent as cluster 1 (18.9%). These patients suffered from vegetative symptoms like increased heart rates (87.8%), increased systolic blood pressure (95.1%), increased temperature (63.4%), sweating (90.2%), and/or tremor (97.6%). Psychopathological symptoms were not prominent in this cluster. Subjects belonging to cluster 3 (40.6%) presented vegetative as well as mild or moderate psychopathological symptoms. Anxiety was the most prominent symptom (100%), whereas disorientation and hallucinations were absent. In cluster 4 (11.1%) the most frequent psychopathological symptoms were disorientation (100%) and anxiety (75.0%). Cluster 5 patients (11.1%) suffered from vegetative as well as severe psychopathological symptoms. High rates of anxiety (70.8%) and disorientation (83.3%) were observed in this cluster as well as—in contrast to clusters 3 and 4—hallucinations in all cases (100%). All these cases fulfilled the diagnosis of delirium tremens.

The mean maximum AWS total scores significantly increased from cluster 1 to cluster 5 (Table 1). Convulsions were observed in all clusters but they occurred most frequently in cluster 4 (12.5%) and cluster 5 (20.8%). Within the first 24 h after admission 81.3% of the convulsions occurred. This was also true for one patient of cluster 1 (case No. 452) who had a convulsion during the admission procedure. Convulsions occurred only in three cases on the second, third, and fourth day. In 50% of the cluster 4, patients disorientation was found only once or twice at the time of assessment (i.e. within a period of 4–8 h) and frequently was not noted by the other members of the staff. Disorientation began with equal frequency by day and by night.

Table 1. Hierarchical cluster analysis: cluster centres and the rates of anxiety, disorientation, and hallucination

	Cluster center							
	Max. VS[a,b]	Max. PS[b,c]	Anxiety[d]	Disorientation[d]	Hallucination[d]	Max. AWS[e]	Convulsions[d]	Days of withdrawal[b]
Cluster 1 ($N = 40$) No relevant symptoms	2.60 ± 1.1	0.65 ± 0.7	—	—	—	3.03 ± 1.2	2.5%	1.3 ± 0.6
Cluster 2 ($N = 41$) Vegetative	6.46 ± 1.4	0.76 ± 0.6	—	—	—	6.85 ± 1.7	4.9%	3.0 ± 1.6
Cluster 3 ($N = 88$) Anxious-vegetative	5.62 ± 2.3	2.25 ± 1.0	100.0%	—	—	7.30 ± 2.6	4.5%	2.8 ± 1.8
Cluster 4 ($N = 24$) Severe psychopathology	7.21 ± 3.1	3.42 ± 2.3	75.0%	100.0%	—	9.67 ± 4.4	12.5%	5.0 ± 2.4
Cluster 5 ($N = 24$) Delirium tremens	6.71 ± 2.6	7.13 ± 3.5	70.8%	83.3%	100.0%	12.42 ± 4.6	20.8%	3.9 ± 2.1
Statistics (df = 4) ANOVA or χ^2-Test	$F = 26.8$***	$F = 79.3$***	$\chi^2 = 178.5$***	$\chi^2 = 196.4$***	$\chi^2 = 217.0$***	$F = 46.8$***	$\chi^2 = 10.6$*	$F = 19.5$***

[a] Maximum vegetative subscore (VS); highest possible score = 17/assessment.
[b] Mean ± SD.
[c] Maximum psychopathological subscore (PS); highest possible score = 17/assessment.
[d] Symptom present.
[e] Maximum AWS-score.
*$P \leqslant 0.05$, ***$P \leqslant 0.001$.

Table 2. Demographic characteristics and alcohol-related history in the five clusters

	Total 217 100.0%[a]	Cluster 1 40 18.4%[a]	Cluster 2 41 18.9%[a]	Cluster 3 88 40.6%[a]	Cluster 4 24 11.1%[a]	Cluster 5 24 11.1%[a]	Statistics df = 4
Sex (%)							
Male	72.8	75.0	73.2	69.3	87.5	66.7	$\chi^2 = 3.7$
Female	27.2	25.0	26.8	30.7	12.5	33.3	
Family status (%)							
Single	35.8	20.5	39.0	44.8	41.7	16.7	$\chi^2 = 17.1$[b]
Married	28.8	41.0	26.8	23.0	20.8	41.7	
Separated (married)	6.5	5.1	7.3	5.7	8.3	8.3	
Divorced	24.2	30.8	19.5	21.8	29.2	25.0	
Widowed	4.7	2.6	7.3	4.6	0.0	8.3	
Age (years, mean ± SD)	41.9 ± 9.1	40.9 ± 8.6	45.0 ± 9.3	40.0 ± 8.8	41.0 ± 7.1	45.7 ± 10.0	$F = 3.68$*
Period of alcohol abuse (years, mean ± SD)	13.5 ± 9.5	14.7 ± 9.6	15.0 ± 11.3	12.3 ± 8.2	14.2 ± 10.4	12.4 ± 9.3	$F = 1.53$
Consumed alcohol 30 days before admission (grams of pure alcohol/day, mean ± SD)	219 ± 125	217 ± 134	190 ± 80	224 ± 132	265 ± 206	206 ± 127	$F = 0.90$
Alcohol blood level at admission (mmol/l, mean ± SD)	18.7 ± 28.8	13.4 ± 23.3	21.9 ± 30.8	16.8 ± 26.3	31.2 ± 35.7	17.2 ± 32.8	$F = 1.7$
Positive history of							
Convulsion (%)	22.1	12.5	12.2	22.7	54.2	20.8	$\chi^2 = 18.8$***
Delirium (%)	14.3	10.0	9.8	11.4	41.7	12.5	$\chi^2 = 16.7$*
Withdrawal syndrome (%)	56.6	62.5	56.1	55.7	58.3	58.3	$\chi^2 = 0.6$
Detoxification (%)	61.8	62.5	48.8	67.0	66.7	58.3	$\chi^2 = 4.3$

[a] Percentage of the row, otherwise percentage of the column.
[b] df = 16.
*$P \leqslant 0.05$, ***$P < 0.001$.

Demographic characteristics and alcohol-related history in the five clusters of alcohol withdrawal

Male patients had consumed more alcohol during the 30 days prior to admission (241.3 ± 127.2 g of pure alcohol per day) than female patients (162.3 ± 98.1). However, males and females did not differ with regard to the period of alcohol abuse (DSM-IV criteria were fulfilled since 13.6 ± 10.0 years in female and since 13.4 ± 9.3 years in male patients) and with regard to previous alcohol withdrawal treatments (62.7% in female, 66.9% in male patients).

While significant gender differences could not be found between the five clusters of alcohol withdrawal, patients in cluster 2 and 5 were slightly older than those in other clusters (Table 2). Neither the years of alcohol abuse nor the quantity of daily alcohol consumption in the last 30 days prior to admission differed between the clusters.

Of all patients, 57.6% reported previous vegetative withdrawal syndromes and 61.8% reported previous detoxification treatments. These rates were also similar in the five clusters. However, cluster 4 patients reported a

significantly higher rate of previous convulsions and delirium states (Table 2).

Medication

Medication was prescribed to 79.3% of patients, carbamazepine to 62.7%, clomethiazole to 37.3%, and haloperidol to 5.5%.

Predicting the five clusters of alcohol withdrawal

In order to predict the five clusters of alcohol withdrawal a discriminant analysis was performed using variables obtained within the first 24 h after admission as independent variables the maximum VS, the maximum PS, and the presence or absence of anxiety, disorientation, and hallucinations (Tables 3 and 4).

Of the subjects, 89.9% were correctly reclassified according to the five clusters. However, for cluster 5 patients, only 58.3%. were correctly reclassified with 41.7% of these patients being falsely allocated most often to cluster 4 or cluster 2 (Tables 3 and 4).

A more detailed analysis of cluster 5 patients comparing correctly and falsely classified subjects has been done. Within the first 24 h we found significantly higher maximum scores, only 58.3% were on the scales 'tactile disturbances' (correct: 1.50; false: 0.20; $T = 3.675$, df = 22, $P = 0.001$) and hallucinations (correct: 2.36; false: 0.40; $T = 4.769$, df = 22, $P < 0.001$) leading to a significant higher maximum PS (correct: 7.21; false: 2.70; $T = 3.752$, df = 22, $P = 0.001$) and maximum AWS score (correct: 12.29; false: 8.00; $T = 3.014$, df = 22, $P = 0.013$) in correctly classified patients. No other differences could be found with regard to vegetative symptoms and other psychopathological symptoms like disorientation, agitation, and anxiety.

In a second step, demographic data (gender, age, and family status) and alcohol-related data (duration of alcohol abuse, grams of pure alcohol per day in the 30 days prior to admission, positive history of convulsions, previous delirium states, withdrawal syndromes, and inpatient detoxifications) were added into discriminant analysis. They did not improve but worsened the results of discriminant analysis (data available on request).

Table 3. Results of the confirmatory stepwise discriminant analysis

	Function 1 41.9%[a]	Function 2 35.5%[a]	Function 3 17.3%[a]	Function 4 5.2%[a]
Maximum scores within the first 24 h after admission				
VS	0.263	0.230	−0.055	0.930[b]
PS	0.569[b]	0.256	0.441	−0.168
Anxiety-score	0.069	0.891[b]	0.44	−0.051
Disorientation-score	0.862*	0.063	−0.113	−0.460
Hallucination-score	0.625	−0.206	0.748*	−0.073

Wilks Lambda:
Function 1–4: df = 20, $\chi^2 = 562.4$; $P < 0.001$.
Function 2–4: df = 12, $\chi^2 = 348.7$; $P < 0.001$.
Function 3–4: df = 6, $\chi^2 = 156.6$; $P < 0.001$.
Function 4: df = 2, $\chi^2 = 41.7$; $P < 0.001$.
[a] Explained variance.
[b] Indicates largest correlation between this variable and this discriminant function; $P < 0.001$.

DISCUSSION

Based on previous findings and clinical observations and using a reliable instrument, we prospectively studied 217 patients after admission to our detoxification unit. We found five clusters of alcohol withdrawal. These clusters represent a preliminary but comprehensive clinical typology of alcohol withdrawal. This typology focuses, first, on the separate consideration of vegetative and psychopathological symptoms and, second, on the presence or absence of specific psychopathological symptoms (anxiety, disorientation, and hallucination). The data do not support the existence of distinct entities of alcohol withdrawal but a model with substantial proportions of the five types clustering along a dimension that represents the severity of alcohol withdrawal in a detoxification sample that is not selected.

Clusters of alcohol withdrawal

The severity of the withdrawal syndrome increased from cluster 1 to cluster 5 in terms of the maximum total AWS score, the maximum PS and—to some degree—the length of the withdrawal syndrome, i.e. the appearance of severe psychopathological symptoms such as disorientation or hallucinations (cluster 4 and 5) was associated with a substantially longer course of withdrawal (average 4–5 days),

Table 4.

	Predicted[a] (%)				
Observed	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Reclassification					
Cluster 1 ($N = 40$) No relevant symptoms	100.0	0.0	0.0	0.0	0.0
Cluster 2 ($N = 41$) Vegetative	7.3	92.7	0.0	0.0	0.0
Cluster 3 ($N = 88$) Anxious-vegetative	2.3	4.5	93.2	0.0	0.0
Cluster 4 ($N = 24$) Severe psychopathology	0.0	0.0	12.5	87.5	0.0
Cluster 5 ($N = 24$) Delirium tremens	4.2	12.5	8.3	16.7	58.3

[a] Overall correct classification: 89.9%.

as expected (Olbrich, 1979). Apart from one subject with a convulsion, no cluster 1 patient developed any complications. Cluster 3 was comparable with cluster 2 with regard to vegetative symptoms, but additional anxiety led to higher PSs. However, because a previous study (Johnston *et al*., 1991) demonstrated that alcoholics with co-existing anxiety disorders experienced more severe alcohol withdrawal symptoms than alcoholics without such a disorder, future studies should clarify whether cluster 3 patients are also burdened by higher rates of lifetime (primary or secondary) psychiatric comorbid disorders. In these cases withdrawal conditions might lead to an exacerbation of pre-existing psychopathology. Anxiety as a major symptom of cluster 3 patients may also trigger specific treatment interventions during alcohol withdrawal. Disorientation and hallucinations as well as moderate and severe tactile disturbances (in 20.9% of all subjects) were noticed for only short periods, i.e. at 1 or 2 assessments (1–8 h). This observation may indicate an underestimation of severe but short-termed psychopathology by clinicians and also in previous investigations.

It may be discussed, if cluster 4 represents a subgroup of cluster 5 (delirium tremens) under the early beginning of neuroleptic therapy, because the absence/presence of hallucinations seem to be the main difference between both clusters. However, previously published prevalence rates of alcohol withdrawal delirium in detoxification samples (Wetterling *et al*., 1994; Palmstierna, 2001) are in agreement with the rate of cluster 5 in this study (11.1%) while the prevalence of cluster 4 and 5 together (22.2%) substantially exceeds this rate.

Convulsions

The overall rate of convulsions was 6.9%, and in all but three cases they occurred within the first 24 h. (Blood levels of anticonvulsive drugs could not be expected to be sufficient in the first 24 h). These observations are in agreement with previous reports (Butler and Messiha, 1986; Adinoff *et al*., 1988). Convulsions were observed in all types of alcohol withdrawal, but most often in cluster 4 (12.5%) and 5 (20.8%).

Implications for treatment

We found withdrawal symptoms at the first day to be able to predict the clinical course of withdrawal in 89.9%, i.e. the established five clusters in our study. Cluster 1 and 2 patients could be identified in 96.3%. Assuming a sufficient anticonvulsive blood level right from the beginning an outpatient treatment of cluster 1 and 2 patients identified within one day of observation seems to be without a substantial risk of complications. Although this is no treatment study, some therapeutic consequences can be discussed. Our results suggest that carbamazepine can sufficiently cope the alcohol withdrawal symptoms in a great proportion of alcoholics, particularly in type 2 and type 3 withdrawal. Carbamazepine showing equal efficacy as barbital and oxazepam in patients with mild alcohol withdrawal (Mayo-Smith, 1997) has the advantage of no relevant sedation effects (like benzodiazepines). Consequently, better use can be made of the opportunity that detoxification offers to apply motivational interventions. However, since a high percentage of our sample showed psychopathological symptoms, especially anxiety, (cluster 3) and the majority of seizures occurred within the first 24 h, a treatment with benzodiazepines for ~48 h seems to be more appropriate (because benzodiazepines can provide a more rapid anticonvulsant effect).

Limitations

In the discriminant analysis over >40% of cluster 5 patients were misclassified. In a more detailed analysis comparing correctly and falsely classified cluster 5 patients we found significant differences only in tactile disturbances and hallucinations within the first 24 h pointing to possible predictive value for most severe pathology. Further studies are needed to elucidate these relationships.

Surprisingly, we did not find an association between lifetime or one month alcohol use (grams of pure alcohol per day) on the one hand and the severity of the withdrawal syndrome on the other hand. This finding differ from previous studies that reported such a relationship supporting the 'kindling hypothesis' of alcohol withdrawal (Ballenger and Post, 1978; Carrington *et al*., 1984; Brown *et al*., 1988; Becker and Hale, 1993). This discrepancy may be owing to the consequent and differentiated drug regime leading to a milder course of alcohol withdrawal in general.

The most striking limitation of our findings is the medication we gave for ethical reasons. In addition, medication was not in all cases strictly prescribed according to rules, a default owing to the clinical environment (e.g. doctors on duty who were not dircectly involved in the study). Thus we cannot refer to the natural course of alcohol withdrawal. In addition, it cannot completely be excluded that treatment itself was associated with the subtypes identified. This limitation, however, may be reduced by two factors: (i) The medication was not the cause but a consequence of the appearance of symptoms. (ii) Discriminant analysis on the basis of data obtained at the first five times of assessment, i.e. when only a minor influence of treatment can be expected—correctly predicted a high percentage of clusters. This finding supports predictive validity of the proposed typology. Further studies using different medical treatment schemes, e.g. benzodiazepines only, are needed to definitely clarify the impact of pharmacological treatment on withdrawal clusters.

CONCLUSION

Our results indicate a comprehensive typology of alcohol withdrawal syndrome and support the importance of anxiety as a frequent symptom of alcohol withdrawal. The careful assessment of withdrawal symptoms during the first hours after admission by using the AWS or other standardized instruments may also be useful in the prediction of the severity of alcohol withdrawal. This will help the clinician to decide on the need of clinical care (outpatient vs inpatient treatment) as well as on the need for early interventions by sedatives and/or antipsychotics in order to prevent the patient from a severe withdrawal syndrome. The impact of comorbidity and the implications of treatment have to be confirmed by further studies.

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